Center for Scientific Review
National Institutes of Health

# Scientific Areas of Integrated Review Groups (IRGs)

For a listing of the Scientific Review Administrator and membership roster for each study section, click on the study section roster under the study section name within an IRG listed below or go to the study section index (study sections listed alphabetically) and click on the specified roster next to the name of the study section.

Last updated on 27th August, 2004

***Referral & Review***

## Biology of Development and Aging [BDA] IRG

PRINTER FRIENDLY

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The Biology of Development and Aging Integrated Review Group (IRG) will consider research applications that are focused on Development and/or Aging and that employ approaches at a variety of levels from molecules to whole organisms. Development and Aging are inherently integrative research areas focusing on biological changes over time. Proposals in this IRG will frequently transcend the boundaries of single organs or systems.

Areas of review related to development include:

Morphogenesis and pattern formation; gastrulation; cell fate, lineage and differentiation; organogenesis; gametogenesis; pre- and post-implantation development; regeneration; evolutionary aspects of development; and the molecular basis of primordial birth defects.

Areas of review related to both development and aging include:

Chromosome dynamics; cell cycle control; cell death; responses to stress; cellular signaling; the biology and applications of stem cells; and tissue repair.

Areas of review related to aging include:

Determinants of longevity; age-related changes in physiological functions; geriatric syndromes and diseases; animal models of aging; predictive markers of biological health and aging; and mechanisms of exceptional aging.

**The following Study Sections are included within the BDA IRG:**

Development 1 [DEV-1]
Development 2 [DEV-2]
Cellular Mechanisms in Aging and Development [CMAD]
Aging Systems and Geriatrics [ASG]
International and Cooperative Projects [ICP]

The expectation is that each of these study sections will receive 50 or more applications. However, in the event of fewer applications, adjustments may be necessary, e.g., as near mirror image study sections, DEV-1 and DEV-

2 could be combined.

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**Development-1 Study Section [DEV-1]**

[DEV-1 Roster ]

This study section reviews applications covering a wide range of topics in developmental biology using diverse animal and plant models. Cellular, biochemical, genetic and molecular approaches to developmental problems at the level of cells, tissues, organs and the whole organism are appropriate. Emphasis is on the development of the gametes and on organogenesis.

**Specific areas covered by DEV-1:**

- Gametogenesis in studies having a developmental focus: Includes imprinting, meiosis, germ cell/somatic cell interactions, and the processes leading to the formation of eggs and sperm.
- Pre-implantation, implantation and placental development in studies aimed at the elucidation of general mechanisms of development.
- Animal cloning: Includes techniques of embryo splitting as well as introduction of donor nuclei into host eggs.
- Organogenesis: Includes signaling and morphogenetic pathways that lead to initial establishment of primordia of organs such as gonads, reproductive tract, heart, lung, limbs, brain and spinal cord, and endodermal organs.
- Differentiation: Includes changes in gene expression and all processes leading to tissue formation and the adoption of specific cell fates.
- Signaling in development: Includes intercellular signals and activation of receptor-mediated signaling pathways leading to changes in developmental potential or fate or differentiation, particularly in the context of the development of the gonads and gametes and in organogenesis.
- Regulatory networks: Include whole genome approaches to profile and analyze regulatory networks in development, particularly in the context of the development of the gonads and gametes and in organogenesis.
- Regeneration: includes regeneration following amputation or injury of organs, limbs, and the nervous system when the focus is a basic developmental question.
- Metamorphosis: Includes both invertebrate and vertebrate metamorphosis.
- Apoptosis: Focuses on how this process participates in developmental processes rather than general apoptotic mechanisms.

**DEV-1 has the following shared interests within the BDA IRG:**

- DEV-1 overlaps substantially with the Development-2 [DEV-2] study section with the exception that organogenesis and gametogenesis are emphasized in DEV-1.

**DEV-1 has the following shared interests outside the BDA IRG:**

- **With the Genes, Genomes and Genetics [GGG] IRG and the Cell Biology [CB] IRG:** Cell biological and genetic studies, when those studies emphasize a developmental question, could be reviewed in DEV-1 as opposed to study sections in the GGG and CB IRGs.

- **With the Immunology [IMM]; Oncological Sciences [ONC]; and Hematology [HEME] IRGs:** The IMM, ONC, and HEME IRGs have developmental components. When the focus of an immunology, oncology, or hematology application is late development, assignment could be to IMM, ONC and HEME.

When the focus is basic, early development, assignment could be to DEV-1 or -2. Areas of shared interest may include stem cells, apoptosis, and cell cycle control.

- **With the Endocrinology, Metabolism, Nutrition and Reproductive Sciences [EMNR] IRG:** Shared interest exists between EMNR and BDA in the areas of meiosis and animal cloning as well as in gonadal and endocrine organogenesis. In general, applications on meiosis and animal cloning that focus on reproductive competency or success would be assigned to the EMNR IRG. Similarly, applications that focus on development (such as cell cycle control, apoptosis, cell fate, or early pattern formation) would be assigned to DEV-1 or -2. In general, when the question being addressed is germane to the development of more than a single organ system, either because it addresses the "primordial organ" or because of the generality of the process being studied, the application would be assigned to BDA. Developmental studies focused on development of a specific organ should be reviewed in the context of that organ system (EMNR in the case of endocrine glands and reproductive organs). The overall philosophy is that assignment should be made based on the central focus of the application.

- **With the Cardiovascular Sciences [CVS]; Musculoskeletal, Oral and Skin Sciences [MOSS]; Digestive Sciences [DIG]; Respiratory Sciences [RES]; and Renal and Urological Sciences [RUS] IRGs :** DEV-1 and -2 include basic, early developmental mechanisms involved in formation of organ primordia, such as muscle, skeleton, skin, liver, lung, and kidney. Studies involving maturation of organ physiology or the physiology and function of developed organs could be assigned to other IRGs such as CVS, MOSS, DIG, RES, and RUS. Overlapping interests may include stem cells, apoptosis, and regulation of cell cycle.

- **With the Molecular, Cellular, and Developmental Neuroscience [MDCN] IRG :** Studies involving maturation of brain and spinal cord or their physiology and function as developed organs may be assigned to MDCN. DEV-1 may include basic, early developmental mechanisms involved in formation of organ primordia, such as the nervous system.

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**Development-2 Study Section [DEV-2]**

[DEV-2 Roster]

This study section reviews applications covering a wide range of topics in developmental biology using diverse animal and plant models. Cellular, biochemical, genetic and molecular approaches to developmental problems at the level of cells, tissues, organs and the whole organism are appropriate. Emphasis is on pattern formation, stem cells, evolution, primordial birth defects, and early embryonic development.

**Specific areas covered by DEV-2:**

- Pattern formation: Includes the process of cells establishing and refining boundaries that lead to morphological and biochemical patterns.
- Signaling in development: Includes intercellular signals and activation of receptor-mediated signaling pathways leading to changes in developmental potential or fate or differentiation.
- Regulatory networks: Include whole genome approaches to profile and analyze regulatory networks in development, particularly in the context of pattern formation, primordial birth defects, and early embryonic development.
- Induction: Includes cell-cell interactions leading to one or both cell types adopting a new cell fate.
- Cell polarity: Includes the establishment and maintenance of cell polarity in eggs and embryos including localization of determinants, localization of signaling molecules, and localization and functions of structural proteins that participate in this process.
- Cell lineage: Includes the spatial and temporal monitoring of a cell and its progeny cells during all of development.

- Apoptosis: Focuses on how this process participates in developmental processes rather than general apoptotic mechanisms.
- Evolution of development: Includes comparative development to understand conserved developmental processes and how they evolved.
- Gastrulation: Includes all aspects of how germ layers of an embryo are formed in terms of cell biology, cell movements, and signaling processes.
- Morphogenesis: Includes cell and tissue movements leading to the development of form.
- Epithelial-mesenchymal transition: Includes cell fate changes in embryos and in organ formation between epithelial and mesenchymal tissues.
- Cell migration: Includes the dynamic cell mixing and behavior inherent in all aspects of development, including gastrulation and nervous system development.
- Birth defects: Includes mechanism-based analyses of primordial birth defects.
- Stem cells: Includes stem cell biology with regard to totipotency and cell commitment.

**DEV-2 has the following shared interests within the BDA IRG:**

- The DEV-2 study section overlaps substantially with DEV-1 with the exception that pattern formation, early development, and birth defect syndromes are emphasized in DEV-2. Applications focusing on stem cell biology with regard to totipotency and cell commitment could be assigned to DEV-2. Applications on stem cells that would be appropriate for CMAD would include studies of stem cells in relation to aging and tissue repair. The DEV-2 study section overlaps with CMAD in the areas of apoptosis and signaling.

**DEV-2 has the following shared interests outside the BDA IRG:**

- **With the Genes, Genomes and Genetics [GGG] and the Cell Biology [CB] IRGs:** Cell biological and genetic studies may be assigned to DEV-2 when those studies emphasize a developmental question. If the focus is cell biological or genetic, then assignment to GGG and CB may be appropriate.

- **With the Immunology [IMM]; Oncological Sciences [ONC]; and Hematology [HEME] IRGs:** IMM, ONC, and HEME have developmental components. When the focus of an immunology, oncology, or hematology application is late development, assignment could be to IRGs IMM, ONC, or HEME. When the focus is basic, early development, assignment could be to DEV-1 or -2. Areas of shared interest may include stem cells, apoptosis, and cell cycle control.

- **With the Endocrinology, Metabolism, Nutrition and Reproductive Sciences [EMNR] IRG:** Shared interest exists between EMNR and BDA in the areas of meiosis and animal cloning as well as in gonadal and endocrine organogenesis. In general, applications on meiosis and animal cloning that focus on reproductive competency or success would be assigned to the EMNR IRG. Similarly, applications that focus on development (such as cell cycle control, apoptosis, cell fate, or early pattern formation) would be assigned to DEV-1 or -2. In general, when the question being addressed is germane to the development of more than a single organ system, either because it addresses the "primordial organ" or because of the generality of the process being studied, the application would be assigned to BDA. Developmental studies focused on development of a specific organ should be reviewed in the context of that organ system (EMNR in the case of endocrine glands and reproductive organs). The overall philosophy is that assignment should be made based on the central focus of the application.

- **With the Cardiovascular Sciences [CVS]; Musculoskeletal, Oral and Skin Sciences [MOSS]; Digestive Sciences [DIG]; Respiratory Sciences [RES]; and Renal and Urological Sciences [RUS] IRGs:** DEV-1 and -2 include basic, early developmental mechanisms involved in formation of organ primordia, such as muscle, skeleton, skin, liver, lung, and kidney. Studies involving maturation of organ physiology or the physiology and function of developed organs could be assigned to other IRGs such as CVS, MOSS, DIG, RES and RUS. Overlapping interests may include stem cells, apoptosis, and regulation of cell cycle.

- **With the Molecular, Cellular, and Developmental Neuroscience [MDCN] IRG:** DEV-2 includes basic developmental mechanisms involved in formation of organ primordia such as brain and spinal cord. Applications focused on developmental neuroscience may be assigned to MCDN.

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**Cellular Mechanisms in Aging and Development Study Section [CMAD]**

[CMAD Roster]

CMAD reviews applications involving molecular and cell biological mechanisms of development and aging, encompassing studies ranging from single cells to whole organisms. The focus is on temporal aspects of: chromosome dynamics, cell death, cell-cycle control, cellular responses to stress, cellular communication, stem cells, physiologic regulation, and determinants of longevity and other age-related functional changes.

**Specific areas covered by CMAD:**

- Aspects of chromosome dynamics relevant to development and aging, including: telomeres; helicases; DNA damage and repair; and chromosome stability.
- Cell death, apoptotic and necrotic, especially as related to development and aging, including age-related degenerative diseases.
- Molecular mechanisms of age-related changes at the cellular or tissue level, e.g., endocrine/reproductive, musculoskeletal, cardiovascular, and immunological.
- Cell cycle control, including the control of embryonic cell cycles and replicative senescence.
- Cellular responses to stress, including embryonic, fetal and adult responses such as: oxidative damage; mitochondrial dysfunction; transcriptional, translational and post-translational modifications and chemical modifications of other cellular components.
- Aspects of cellular communication especially as related to aging, including: intracellular, intercellular, and matrix-cell communication; signaling pathways; gene regulation; and cell differentiation.
- Fundamental biology of stem cells, including: their application to development and disease; their role and use in tissue regeneration and repair; stem cell senescence and death.
- Genetic and environmental determinants of longevity and age-related functional changes, including: fetal origins of adult disease; mechanistic aspects of metabolic imprinting; dietary restriction; and mechanistic aspects of genetic and hormonal manipulation of organismal longevity.
- Evolution of aging, including comparative studies of mechanisms of aging.

**CMAD has the following shared interests within the BDA IRG:**

Areas of overlap between CMAD and DEV-1/DEV-2 include studies of stem cells and apoptosis. Distinguishing features of applications appropriate for CMAD would include studies of stem cells in relation to aging and tissue repair, basic cellular and molecular properties of stem cells and apoptosis, apoptosis in degenerative diseases, and cellular signaling as related to mechanisms of aging.

Proposals that concern areas of overlap between CMAD and ASG, such as those dealing with approaches to enhancing longevity, would be more appropriately assigned to ASG if they focus on organ or multi-organ physiology as opposed to cellular or molecular mechanism.

**CMAD has the following shared interests outside the BDA IRG:**

CMAD appropriately reviews fundamental mechanistic studies that relate to both developmental disorders and the pathobiology underlying aging and degeneration. Studies designed to address general principles, particularly those not focused on a developmental or aging process, may be considered by the appropriate organ-focused

IRG.

- **With the Biological Chemistry and Macromolecular Biophysics [BCMB] IRG:** Studies designed to address principles of chemistry and biophysics, unrelated to organism development, aging and their perturbations could be appropriately considered by BCMB. Studies using the general principles of chemistry and biophysics to address development, aging, and their perturbations could be appropriately considered by CMAD.

- **With the Genes, Genomes and Genetics [GGG] and the Cell Biology [CB] IRGs:** Studies designed to address the general principles of gene and cell function, unrelated to whole organism development, aging and their perturbations could be appropriately considered by GGG and MACFI. Studies using the general principles of gene and cell function to address development, aging, and their perturbations could be appropriately considered by CMAD.

- **With the Genes, Genomes and Genetics [GGG] IRG:** Studies designed to address basic genetic principles in humans and model organisms, unrelated to whole organism development, aging, and their perturbations could be appropriately considered by GGG. Studies using genetic principles to address development, aging, and their perturbations could be appropriately considered by CMAD.

- **With the Oncological Sciences [ONC] IRG:** Studies of genetic instability related to cancer diagnosis, prognosis, and treatment could be appropriately assigned to ONC. Studies of cancer in the context of development or aging, particularly in multiple organs, could be assigned to CMAD.

- **With the Hematology [HEME] and Cardiovascular Sciences [CVS] IRGs:** CMAD may review fundamental mechanistic studies that relate to both developmental disorders and the pathobiology underlying aging and degeneration, particularly when the studies transcend single organ systems or disciplines. Studies designed to address mechanistic principles, not focused on a developmental or aging process, may be considered by the appropriate organ-focused IRG such as HEME or CVS. Overlapping interest may include arterial sclerosis associated with aging.

- **With the Endocrinology, Metabolism, Nutrition and Reproductive Sciences [EMNR] IRG:** Studies of hormonal and nutrient manipulations to increase the lifespan may be appropriately assigned to CMAD or ASG. If the focus is a better understanding of diabetes, nutrition, or hormone action per se, assignment could be to EMNR. Shared interests may include cell cycle control and apoptosis.

- **With the Musculoskeletal, Oral and Skin Sciences [MOSS]; Digestive Sciences [DIG]; Respiratory Sciences [RES]; and Renal and Urological Sciences [RUS] IRGs:** CMAD may review fundamental mechanistic studies that relate to both developmental disorders and the pathobiology underlying aging and degeneration, particularly when the study transcends single organ systems or disciplines. Studies designed to address mechanistic principles, particularly those not focused on a developmental or aging process may be considered by the appropriate organ-focused IRG such as MOSS, DIG, RES and RUS. Areas of shared interest may include degeneration/regeneration and pharmacological changes with aging.

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**Aging Systems and Geriatrics Study Section [ASG]**

[ASG Roster ]

The Aging Systems and Geriatrics study section reviews applications involving aging humans or animals, in particular studies of postmaturational changes, which transcend single organ systems or disciplines, and which may require integrated experimental, genetic or observational approaches.

## Specific areas covered by ASG:

- Age-related changes in the regulation of complex physiological functions, such as the musculoskeletal system (including motor function, postural control, and balance); metabolic/endocrine systems (including impaired glucose tolerance); reproductive systems (including menopause and andropause); host defense responses to infection, injury or other stresses (including immunologic function); blood pressure; body weight, body temperature, fluid and electrolyte homeostasis, as well as the study of interventions to ameliorate these age-related changes.
- Geriatric syndromes (i.e., age-related conditions involving multiple systems and/or multifactorial mechanisms) and their prevention or treatment. These include: falls, syncope, frailty, immobility, delirium, incontinence, polypharmacy, malnutrition, mood disorders, sarcopenia, chronic pain, loss of functional independence, and failure to thrive. Interventions may include exercise, hormones, nutrition, medications, technology, and lifestyle modifications.
- Descriptive, mechanistic, and intervention studies of geriatric diseases affecting multiple body systems that are unique or highly prevalent in elderly people or aging animals. The focus should be on an aging population, the role of comorbid health conditions, or complex outcomes relating to overall functional status and multiple systems. Examples include congestive heart failure (especially, diastolic dysfunction), atrial fibrillation, hypertension (especially systolic hypertension), type 2 diabetes and its complications, osteoarthritis, osteoporosis and related bone fractures.
- Regulation of life span and rates of aging changes in animal models employing approaches such as comparative biology, caloric restriction, and animals especially resistant to aging processes.
- Development and validation of predictive markers of biological health and aging.
- Studies of mechanisms of exceptional aging, including premature aging syndromes, extreme longevity and factors contributing to sustained health without significant diseases or disability into advanced age.
- Age-related changes in pharmacokinetics and dynamics.
- Modeling of complex regulatory networks (such as those affecting cardiovascular function, circadian rhythms, and postural control) and their alteration with age.

## ASG has the following shared interest within the BDA IRG:

Studies with a primary focus on physiologic mechanisms of aging, geriatric syndromes and the effect of aging on manifestations of geriatric diseases and/or involving multiple organs or systems could be reviewed by ASG. Studies focused on basic molecular and cellular aspects of aging could be reviewed by CMAD when those studies concern fundamental cell or molecular biology and by ASG when those studies concern systems-level approaches or analyses.

## ASG has the following shared interests outside of the BDA IRG:

- **With the Bioengineering Sciences and Technologies [BST] IRG:** Applications that focus on basic modeling techniques could be assigned to BST. Applications that apply modeling techniques to the aging process could be assigned to ASG.

- **With the Health of the Population [HOP]; Risk, Prevention and Health Behavior [RPHB] and Biobehavioral and Behavioral Processes [BBBP] IRGs:** Applications with a primary focus on physiologic or biological processes could be reviewed by ASG when an aging population is specifically studied. However, applications with a primary focus on behavioral or social antecedents or outcomes, e.g., epidemiologic studies, dementia, falls, mood disorders, behavioral prevention and management of physical diseases, and cognitive or linguistic impairments, could be reviewed by the HOP, RPHB and BBBP IRGs.

- **With the Oncological Sciences [ONC]; Hematology [HEME]; and Cardiovascular Sciences [CVS] IRGs:** Studies primarily focused on a single organ or system or a specific disease in which age-related interactions or changes of function are a minor or secondary component could be reviewed by the appropriate organ or system IRG, such as ONC, HEM and CVS. Studies in which the focus is aging,

particularly those that transcend single organ systems or disciplines, could be reviewed in ASG. Cancer and arterial sclerosis, though increased in prevalence with age, could remain with ONC or CVS, except when the focus is on the contribution of the aging process rather than on the disease.

- **With the Endocrinology, Metabolism, Nutrition and Reproductive Sciences [EMNR] IRG:** Male and female reproductive aging across and within the hypothalamic-pituitary-gonadal (H-P-G) axis and other reproductive tissues where the focus is on the endocrine system could be assigned to EMNR. If the focus is on mechanisms of aging, such as oxidative stress, DNA damage, or cellular senescence, particularly when the study transcends single organ systems or disciplines, the applications could be assigned to ASG. Interactions between the H-P-G axis and non-reproductive physiologic systems could be assigned to ASG if the focus is on aging research. Areas of unavoidable shared interest such as menopause would be resolved according to the central focus of the application.

- **With the Musculoskeletal, Oral and Skin Sciences [MOSS] IRG:** Aging studies that use the musculoskeletal system as a model to address questions having applicability beyond the musculoskeletal system may be assigned to ASG. Studies that address questions applicable to the musculoskeletal system or its diseases may be assigned to MOSS. When osteoporosis is a secondary aspect of a multi-system study of the aging process, assignment could be to ASG; when osteoporosis is the primary focus of study, assignment could be to MOSS. Studies of aging, disability, and rehabilitation medicine are shared with MOSS. Musculoskeletal studies involving interactions with age-related changes in other physiological systems could be assigned to ASG. When musculoskeletal function or rehabilitation is the primary study focus, assignment could be to MOSS.

- **With the Digestive Sciences [DIG]; Respiratory Sciences [RES]; and Renal and Urological Sciences [RUS] IRGs:** Studies primarily focused on a single organ or system or a specific disease in which age-related interactions or changes of function are a minor or secondary component could be reviewed by the appropriate organ or system IRG, such as DIG, RES and RUS. Studies in which the focus is aging, particularly those that transcend single organ systems or disciplines, could be reviewed in ASG. Areas of shared interest may include pharmacokinetic changes during aging.

- **With the Integrative, Functional, and Cognitive Neuroscience [IFCN] IRG:** Applications with a primary focus on aging aspects of motor movement integration or memory could be reviewed by ASG particularly when the studies transcend single organ systems or disciplines. Aging studies of motor movement integration and memory in the context of cognitive neuroscience could be assigned to IFCN.

- **With the Brain Disorders and Clinical Neuroscience [BDCN] IRG:** Applications with a primary focus on specific neurological diseases, such as Alzheimer's disease, could be reviewed in BDCN; however, proposals focused on multiple system manifestations of such diseases, including gait abnormalities, could be reviewed by ASG.

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**International and Cooperative Projects Study Sections [ICP-1, ICP-2 and ICP-3]**

[ICP-1 Roster ] [ICP3 Roster]

The International and Cooperative Projects [ICP] Study Sections address international collaborative research applications processed and supported by the Fogarty International Center and other special programs supported by the various institutes.

The applications are broad and involve the biomedical, biochemical, neurological, physiological, clinical, and public health sciences. Members of the Study Sections therefore constitute broadly multidisciplinary review

groups.

The ICP Study Sections review applications from specific programs emanating from the Fogarty International Center. Shared interests and shared coverage with other review groups are minimal.

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